NON-PUBLIC?: N
ACCESSION #: 9311160312
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Millstone Nuclear Power Station Unit 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000245

TITLE: Spurious Reactor Trip
EVENT DATE: 10/05/93 LER #: 93-018-00 REPORT DATE: 11/05/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Drexel N. Harris, Site Licensing TELEPHONE: (203) 437-5903

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: 350 COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On October 5, 1993, at 0859, while operating at 100% power, a spurious reactor scram occurred. The scram event was not preceded by any warning or annunciation. Operators performed actions specified in appropriate procedures and stabilized the plant. As a result of the scram, reactor vessel water level decreased to the Group II isolation setpoint, and as expected initiated the Standby Gas Treatment (SGT) System. Other than the Reactor Protection System (RPS) and SGT, no other safety systems were called upon during this event.

The scram cause is unknown and it has been determined to be spurious. Because the cause was unknown, all surveillances related to the RPS were performed as specified in the Scram Recovery procedure. The surveillance results indicated that the RPS is fully functional and operated according to its intended design.

END OF ABSTRACT

I. Description of Event

On October 5, 1993, at 0859, while operating at 100% power, a spurious reactor scram occurred. The scram event was not preceded by any warning or annunciation. Operators performed actions specified in appropriate procedures and stabilized the plant. As a result of the scram, reactor vessel water level decreased to the Group II isolation setpoint, and as expected initiated the Standby Gas Treatment (SGT) System. Other than the Reactor Protection System (RPS) and SGT, no other safety systems were called upon during this event.

Following the reactor scram, a 4160V bus failed to automatically transfer from the Normal Station Services Transformer (NSST) to the Reserve Station Services Transformer (RSST) after the main generator was manually tripped. This failure to automatically transfer occurred about 90 seconds after the scram and is not considered a cause of the scram. Following an immediate investigation of the breaker, the 4160V bus was reenergized by manually closing the breaker from the Control Room.

Analysis of scram time data after the scram indicated that 68 control rods started moving into the core approximately 0.5 seconds after the other 77 control rods began to insert. All control rod scram times, from the time of scram solenoid valve deenergization, met Technical Specification requirements. This indicates that the control rod drive system responded properly. It was determined that only a portion of the control rods received a full scram signal because the spurious scram signal duration was so short that the RPS did not completely actuate (See Figure 1). The 77 rods that initially scrammed caused the Scram Air Header to depressurize, as expected. A second scram signal was generated when the Scram Air Header Low Pressure Scram setpoint was reached. The remaining 68 control rods began to insert in response to the Scram Air Header Low Pressure Scram signal.

The Process Computer did not log the initiating sensor and indicated that only one scram sub channel actuated. RPS is designed to support a single sub channel (A1, A2, B1, or B2) or a single channel (A or B) signal, whether valid or not, and not scram the reactor; a full scram requires signals in at least one sub channel of each RPS channel. The sequence of events (SOE) data combined with the knowledge that SOE contacts on the HFA relay must travel full stroke

to make- up explained the lack of information obtained by the SOE. RPS input signals are sent as soon as the relays begin to travel because the RPS contacts are normally closed and open early in the contact travel. Therefore, a short duration signal could cause the RPS to see a scram condition and cause the SOE to not detect a change in state on the initiating device.

The Instrumentation and Control (I&C) Department verified that

non-demand short duration and spurious trip signals are not always recorded in the Process Computer sequence of events data.

II. Cause of Event

The root cause of this scram is unknown and it has been determined to be spurious.

Because the scram was spurious, an Event Review Team (ERT) evaluated every scram signal, both manual and automatic, to target those which would require detailed investigation. The ERT investigation concentrated on scram signal parameters that operate relatively close to their trip setpoints during normal plant operation and had switches that could produce a full scram located in one general area. The three parameters that met these two conditions were Reactor High Pressure, Drywell High Pressure, and Main Condenser Low Vacuum. The ERT eliminated Reactor High Pressure as an initiator based on test results and personnel interviews. Drywell High Pressure was eliminated based on test results, the margin associated with the range of the pressure switch versus its setpoint, and that no one was working near the switches at the time of the scram.

When the scram occurred, I&C personnel were conducting a surveillance on an Isolation Condenser pressure switch on an Instrument rack located in the Reactor Building. The switch does not interface with the RPS. This rack contains pressure switches for both RPS Channels A and B (Drywell High Pressure and Reactor High Pressure Scrams). The ERT interviewed the I&C technicians involved, reviewed the procedure used, performed detailed walk-downs of the work area, and rigorously tested instruments at the rack to identify the source of the scram. The instrument rack was also tested to determine its sensitivity to mechanical shock. During this test, the pressure switches were pressurized to near normal operating pressure to simulate conditions that were present at the time of the scram. The ERT concluded that it was unlikely that the

spurious scram signal originated from that instrument rack.

With respect to the Main Condenser Low Vacuum switches it was discovered that they are very sensitive to mechanical shock and may produce reactor scram signals if they are disturbed while condenser vacuum is established. Vacuum switch testing produced results very similar to those produced when the scram occurred. The test results strongly indicated that the vacuum switches could have been the initiating devices for the scram and are considered the most probable initiating devices. However, the ERT was unable to establish that there was any personnel or direct activity near the vacuum switches when the reactor scrammed.

III. Analysis of Event

This event is reportable pursuant to 10CFR50.73(a)(2)(iv) which requires reporting of any event or condition that resulted in a manual or automatic actuation of any ESF, including the RPS. No safety consequences resulted from this event.

Assessments were completed related to the effects of the delay in receiving the full reactor scram. Assistance in performing those assessments was obtained from the General Electric Company Three issues were addressed: effects on the core, consistency with the design of the Reactor Protection System (RPS), and consistency with the design basis of the plant.

General Electric provided an assessment of this event with respect to effects on the reactor fuel. No detrimental effects were identified. It is noteworthy that, for this event, the core average control rod scram time for 20% insertion, even in consideration of the delay experienced by the effected control rod groups, was within the Technical Specification limit of 0.900 seconds. The 20% insertion time has significance in that it is used in analyses in determining reactivity insertion to mitigate transients that result in decreasing the margin to departure from nucleate boiling (DNB) in the core. Since no actual limiting transient occurred and no analysis assumptions were exceeded, there was no adverse impact as a result of this event. It is also noteworthy that, because of the locations of controls rods that were delayed, which is a function of the reactor design, no momentary control rod configurations that could have resulted in local excessive core powers existed. This is also supported by the short duration of the event (typical control rod insertion times are approximately 3 seconds)

A review of this event with respect to the performance of the RPS showed no degradation in RPS performance. For spurious signals postulated to be in the range of 8 to 12 milliseconds, relay and contact timing can result in the system response experienced in this event. This response is a consequence of the RPS design in that the response times of the initiating relays must be very short to ensure quick system response to real events, making the system vulnerable to short duration spurious events. There are no adverse safety consequences to these events. A review of integrated RPS performance during this event, supported by subsequent system testing, indicated that the system responded as designed when required to do so.

The event was also assessed with respect to the design basis of the plant, and was determined to be within the design basis. This event is well within the envelope of all analyzed plant transients, especially given the fact that no normal plant operating parameter that requires a reactor scram was exceeded. In the unlikely event that no secondary signal occurred to cause a subsequent valid reactor scram signal and insertion of the remaining control rods, the configuration of the rods that inserted would have resulted in the core being in a hot shutdown condition. This is the result of plant design.

IV. Corrective Action

All RPS surveillances were performed to verify the integrity of RPS. The test results indicated that RPS was fully functional.

The Main Condenser Vacuum switches were modified before startup to desensitize them to mechanical shock and vibration. Flexible instrument tubing was installed between the instrument rack and the tubing supports to reduce the possibility of spurious scrams from the vacuum switches.

In accordance with Technical Specification requirements, the Plant Operation Review Committee reviewed all aspects of the trip prior to startup and insured that all issues were properly addressed before recommending that the plant be started up.

The 4160V breaker that did not automatically operate was removed from service and a spare breaker was installed in its place. The removed breaker was bench tested and visually inspected. The breaker operated correctly and no conditions were identified that would prevent the breaker from functioning.

A simulated fast transfer from the NSST to the RSST was conducted to verify that the fast transfer logic was functional. The test was successful and showed that the entire logic train was working properly.

Evaluation of options to improve plant reliability associated with instrument racks are continuing. Plant engineers are evaluating methods that could improve the SOE function.

V. Additional Information

None

Figure "RPS AUTOMATIC TRIP SUBCHANNELS" omitted.

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November 5, 1993
MP-93-889

NORTHEAST UTILITIES
NU The Connecticut Light And Power Company
Western Massachusetts Electric Company
Holyoke Water Power Company
Northeast Utilities Service Company
Northeast Nuclear Energy Company

Re: 10CFR50.73(a)(2)(iv)

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Reference: Facility Operating License No. DPR-21
Docket No. 50-245
Licensee Event Report 93-018-00

Gentlemen:

This letter forwards Licensee Event Report 93-018-00 required to be submitted within thirty (30) days pursuant to 10CFR50.73(a)(2)(iv).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: Stephen E. Scace
Vice President - Millstone Station

BY: Harry F. Haynes
Millstone Unit 1 Director

SES/DNH:ljs

Attachment: LER 93-018-00

cc: T. T. Martin, Region I Administrator
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3
J. W. Andersen, NRC Acting Project Manager, Millstone Unit No. 1

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